

## MISSISSIPPI DEPARTMENT OF TRANSPORTATION

| **SPECIAL PROVISION NO. 907-606-8**

**CODE: (SP)**

| **DATE: 05/15/2014**

**SUBJECT: High Tension Cable Barrier**

Section 606, Guard Rail, of the 2004 Edition of the Mississippi Standard Specifications for Road and Bridge Construction as amended by this special provision is applicable to High Tension Cable Barrier Only.

**907-606.01--Description.** This work shall consist of constructing high tension cable barrier by designing, laying out, furnishing and installing posts, cables, terminal sections (end terminals), and any special connections and fittings which may be required in the contract documents. This also includes maintenance and repair of the system until final acceptance of the project.

Cable barrier shall be staked and layed out by the Contractor in accordance with the plans or as directed by the Engineer.

High tension cable barrier shall meet the requirements of NCHRP Report 350, Test Level 4 (TL-4) criteria. The Contractor shall provide a copy of the FHWA letter of approval for the system prior to installation.

The high tension cable barrier system shall be a four (4) wire rope system with maximum post spacing of 10.5 feet, center to center, and be appropriate for applicable field conditions and speed rating.

In addition to certifications, the Engineer may opt to sample any materials to be used in the work at any time ranging from the point of manufacture to the construction site for whatever testing or inspection the Engineer deems necessary.

The Contractor shall select and install only one single manufacturer's high tension cable barrier system for the entire project. Terminal sections and high tension cable barrier shall be produced by the same manufacturer.

| **907-606.02--Materials.** High tension cable barrier shall meet the following general requirements.

Concrete, minimum Class C .....	Section 804
Reinforcing Steel .....	Section 602
Anchor Bolts and Nuts .....	Subsection 810.02.21
Galvanizing (Bolts, Nuts & Washers) .....	AASHTO M 232
Fittings (Steel) Hardware .....	Subsection 712.06
Reflective Sheeting .....	Subsection 721.07

**907-606.02.1--Cable.** The cable shall be ¾-inch, 3 x 7, pre-stretched galvanized wire rope

meeting the requirements of AASHTO Designation: M 30 / ASTM Designation: A741, Type I, Class A coating, with a Modified Breaking Strength equal to 39,000 pounds in accordance with the following:

- Pre-stretched to exhibit a minimum modulus of elasticity of 21,661,553 psi based on a steel surface area of a fixed 0.2394877 square inches, and
- Testing must be done in accordance with ISO 12076-202 Wire Rope Modulus of Elasticity "Initial (as manufactured)", with no bedding of the rope permitted in testing.

**907-606.02.1--Posts.** Steel posts shall be socketed in metal or plastic sleeves installed in a concrete footing. Steel posts, blocks, and metal sleeves shall conform to AASHTO Designation: M 270, Grade 36, and shall be galvanized in accordance with ASTM Designation: A 123. Welding and repair welding for all steel fabrication shall be performed by certified welders and meet the requirements of AWS D1.1. All fabrication shall be completed prior to galvanizing.

Posts shall be domestic hot-rolled mild steel, or cold-formed from hot-rolled mild steel. A fitting gasket, profiled to fit tightly around each post, shall be provided to prevent debris from entering the socket.

**907-606.02.2--Fittings.** Threaded terminals may be wedged or swaged fitting. Swaged fitting may be shop or field swaged. The engagement depth shall be equivalent to or greater than the depth of the tested system and shall be threaded to fit the system turnbuckles. Fully fitted ropes shall develop a Minimum Breaking Load (MBL) of 36,800 pounds. Threaded terminals shall be galvanized, after threading, to ASTM Designation: A 153, or stainless steel. At all locations where the cable is connected to a cable socket with a wedge type connection, one wire of the wire rope shall be crimped over the base of the wedge to hold it firmly in place.

**907-606.02.3--Turnbuckles.** Turnbuckles shall be threaded to accept the fittings described above. Turnbuckles shall be of the solid or closed body type with two inspection holes to determine threaded rope terminal penetration. Turnbuckles shall allow for a terminal penetration depth equivalent to or greater than the depth of the tested system, shall develop minimum tensile load without yielding to 36,800 pounds, and shall be galvanized, after threading, to ASTM Designation: A153, or stainless steel.

**907-606.02.4--Mechanical Anchor Fittings.** Fittings shall be provided at the anchor terminations of each wire rope and shall be of the same type as used in the connection to the turnbuckles. The fittings shall develop minimum tensile load of the entire wire rope of 36,800 pounds without yielding, shall be capable of release and reuse, and shall be galvanized to ASTM Designation: A153 after threading.

**907-606.02.5--End Terminals.** End terminals shall be NCHRP Report 350 compliant, meeting Test Level 3 (TL-3) requirements, and having an FHWA letter of acceptance. Each of the four cables of the system shall have anchor connections at the terminal end section. The four cables shall not terminate at the end section with a common cable. All welding shall be performed by a certified welder in accordance with AWS D1.1.

**907-606.02.6--Delineation.** The sheeting for delineation shall be Type III retroreflective

sheeting meeting the requirements of Section 721 of the Standard Specifications. Sheeting shall be available in standard colors of white and yellow and may be installed on cable barrier posts or on delineator posts which are attached to the cable barrier post in accordance with the manufacturer's recommendations.

When used, delineator posts shall be made of high impact fiberglass reinforced composite, engineering blended plastic or thermosetting polymers which is reasonably unaffected by long term U.V. exposure and shall be of good workmanship free of burrs, discoloration, contamination and other objectionable marks or defects that affect appearance or serviceability.

**907-606.03--Construction Requirements.** A manufacturer's representative shall be present during the initial installation of all components (posts, anchors, tensioning) of the cable barrier system. Upon completion of the entire system, a manufacturer's representative shall inspect and certify in writing that the cable barrier system was installed in accordance with the design and manufacturer's recommendation.

**907-606.03.1--Cable.** The Contractor shall install high tension cable barrier system according to the manufacturer's design and recommendations. Prior to construction, the Contractor shall provide the Engineer with two copies of the manufacturer's most current product manuals covering installation and maintenance of the barrier system including detailed drawings.

Turnbuckles shall be included to allow for tensioning of the cables. For installations greater than 1000 feet in length, at least one turnbuckle per 1000-foot strand shall be included. For installations less than 1000 feet in length, one turnbuckle per strand shall be included near the center of the installation.

**Cable Barrier Tensioning.** The cable barrier system shall be placed and tensioned immediately after initial installation per the manufacturer's recommendations. The tension shall be rechecked approximately two (2) to three (3) weeks after initial tensioning and adjusted, if necessary. Concrete shall have a minimum compressive strength of 3,000 psi prior to applying tension to the cables. The compressive strength shall be verified by cylinder tests. The Contractor shall maintain a log showing the date, time, location, temperature, and final tension reading. The log shall be signed by the person performing the readings. The log shall be given to the Project Engineer at the conclusion of the re-tensioning period.

The Contractor shall be responsible for providing the Project Engineer with an inventory table of all high tension cable barrier installed prior to the final inspection of the project. The inventory should include the following data: County, Route, Date Installed, System Name, Manufacturer, Beginning and Ending Latitude/Longitude at each terminal (DECIMAL), and the tension (LBS) of each cable taken near every turnbuckle in a section.

**Cable Splices.** Only one splice per cable is allowed between end anchor assemblies. Cable splices shall be staggered a minimum of 20 feet from splices on adjacent cables. Cable splices shall be made in accordance with the recommendations of the manufacturer of the splice hardware.

**907-606.03.2--Posts.** The posts shall be installed plumb and in accordance with the

manufacturer's recommended location, spacing, and elevation.

All posts shall be socketed steel posts. Sleeves for insertion of socketed posts shall be set in concrete foundations. All posts shall have a means of holding the wire ropes at the design height.

Post foundations shall be to the size and shape recommended and designed by manufacturer based on soil types and ground conditions. The contract documents may include information regarding the existing soil, but is the Contractor's responsibility to supply the designer of the cable barrier with all the soil information needed to design the cable system. The depth must be determined by manufacturer's Design Engineer for the project's existing soil condition, but the minimum size shall not be less than 12 inches in diameter by 36 inches in depth (12" x 36").

**907-606.03.3--Terminal Section.** Concrete for end terminals shall be a minimum Class C in accordance with Section 804 of the Standard Specifications.

End terminal foundations shall be placed in excavations of natural, undisturbed ground, to the size and shape required by the manufacturer based on soil types and ground conditions. The contract documents may include information regarding the existing soil, but is the Contractor's responsibility to supply the designer of the cable barrier with all the soil information needed to design the cable system. If over-excavation is unavoidable, the sides must be vertical and additional concrete shall be used to completely fill the excavated area. Alternatively, foundations may be formed and cast, then backfilled by a means to achieve a compacted density acceptable to the Engineer.

Exposed concrete shall be finished in accordance with the manufacturer's recommendations and as directed by the Engineer.

**907-606.03.4--Delineating High Tension Cable Barrier.** High tension cable barrier installations shall be delineated with retroreflective sheeting. Unless otherwise indicated, the delineation shall be applied to the last five posts at each end of an installation and throughout the remainder of the installation at a maximum spacing of 50 feet. The delineation shall provide a minimum of seven (7) square inches of area per post when viewed on a line parallel to the roadway centerline. The delineation shall be attached near the top of the post as recommended by the manufacturer. For median installations, the sheeting shall be applied to both sides of the post. For roadside installations, the sheeting shall be applied only to the side of the post facing traffic. The sheeting shall be yellow or white and shall be the same color as the adjacent edge line.

The Contractor may elect to attach delineators to the posts in accordance with the manufacturer's recommendations.

**907-606.03.5--Installation Training.** The Contractor shall provide a minimum of eight (8) hours of instruction on the installation, maintenance and repair of the system. This training shall be provided in a location central to the project and the local District Office. The scheduling and location of this training shall be approved by the Engineer. The Project Engineer will advise the District Maintenance Representatives of the training location and schedule.

The Contractor shall provide on-site field instruction by the manufacturer of the system using a minimum 2000-foot section of the system. The amount of this training will be as necessary to provide field training on all aspects of the system installation, including grading, line post installation, wire rope installation and tensioning, and terminal or anchor installation. Upon completion of the cable barrier system or within ten (10) days of the Maintenance Release, the Contractor shall deliver to the Project Engineer one new cable tensioning device/meter for future MDOT maintenance activities. This device shall become the property of MDOT and its cost shall be included in other items bid.

**907-606.03.6--Cable Barrier Repair.** The Contractor shall maintain and repair the cable barrier until final inspection of the project. Should the cable barrier be damaged, the Contractor shall repair the barrier immediately. The cable barrier post shall be replaced and the cable re-installed to the post. When the damage is caused by the traveling public to a complete-in-place section of cable barrier, the repair will be paid for under pay item Cable Barrier Post Repair.

**907-606.04--Method of Measurement.** Cable barrier will be measured by the linear foot. The length of cable barrier will be the length of installation not including lengths of high tension cable barrier terminal sections. Cable barrier terminal section will be measured per each. Cable barrier post repair will be measured by each replacement post required to repair the cable barrier.

**907-606.05--Basis of Payment.** Cable barrier, measured as prescribed above, will be paid for at the contract bid price per linear foot, which price shall be full compensation for all materials, equipment, tools, staking, lay out, and labor necessary to complete installation of the cable barrier, including post foundations, delineators, other hardware, any excavation and backfilling, and training necessary to complete the work.

Cable barrier terminal section, measured as prescribed above, will be paid for at the contract bid price per each, which price shall be full compensation for all materials, equipment, tools, staking, lay out, and labor necessary to complete the installation of the cable barrier terminal section, including post foundations, delineators, anchors, reinforcing steel, other hardware, any excavation and backfilling, and training necessary to complete the work.

Cable barrier post repair, measured as prescribed above, will be paid for at the contract bid price per each post, which price shall be full compensation for all labor, tools, replacement posts, post connectors, delineators, foundation repairs, miscellaneous hardware, and incidentals necessary to complete the repair of a damaged section of cable barrier.

Payment will be made under:

907-606-G: Cable Barrier	- per linear foot
907-606-H: Cable Barrier Terminal Section	- per each
907-606-I: Cable Barrier Post Repair	- per each